Remarks

Claims 1-9 and 11 are pending in the application and stand rejected. Claim 10 has been canceled without prejudice or disclaimer.

Claim rejections

Section 102

Claims 1-9 and 11 were rejected under 35 USC 102(b) as being anticipated by Collins et al. (US 6,322,915) ("Collins"). The Applicant respectfully traverses. Collins does not support the asserted rejection for at least the reason that Collins does not disclose a bypass that connects an upstream-side stage of a gas passage of a separator to a downstream-side stage of the gas passage, wherein a gas inlet to the separator and a gas outlet from the separator are located at a same side of the separator and opposite to the bypass, as recited in independent claims 1 and 6.

Instead, Collins discloses a humidification system (i.e., separator) provided with a bypass (i.e., coolant flow field 124) by which coolant flows from an upstream side to a downstream side. That is, the bypass is formed in the coolant passage in the separator. The bypass is not formed in the gas passage of the separator. The purpose of the bypass in Collins is to control humidity of reaction gas by equalizing the temperature of the surface of the cell. A junction (i.e., meeting place) of the bypass and the serpentine gas passage of a fuel cell is very close to a coolant outlet 132, because the purpose of Collins' arrangement is to equalize the temperature of the surface of the cell, as described above. Therefore, the gas of the serpentine passage and the coolant are not mixed at the downstream side of the serpentine gas passage.

Moreover, Collins does not disclose a gas inlet to the separator and a gas outlet from the separator that are located at a same side of the separator and opposite to the bypass, as noted previously. The Examiner contends that this arrangement is disclosed in FIG. 2, reference numbers 50 and 52. However, reference numbers 50 and 52 do not indicate a gas inlet and outlet, but an anode catalyst and a cathode catalyst, respectively. Moreover, no relationship of the reference numbers 50 and 52 to any bypass is disclosed in Collins.

An advantage of the noted claimed feature is that an electric power generation region of the separator is not substantially reduced, so that the power generation performance of the fuel cell will not be substantially reduced and the compact design of the fuel cell will not be substantially impeded.

More generally, Collins relates to an entirely different structure from the claimed structure. Specifically, FIG. 5 of Collins, for example, relates to a coolant passage, not a gas passage as recited in the claims of the present application. According to the present invention as claimed, a bypass 32 is formed within a gas passage. The purpose of the bypass is to curb the gas concentration drop on the downstream side (in other words, to decrease a difference of gas concentration between the upstream side and downstream side) and to promptly discharge water generated in the upstream side. Therefore, it is the point of the present invention that the gas of the serpentine gas passage at the upstream side is mixed with the gas of the serpentine passage on the downstream side of the serpentine passage. Collins does not contain any suggestion of the latter. Instead, as noted, Collins relates to a coolant passage.

The Examiner alleges in the 2nd Office Action that "*Collins et al. discloses a gas passage having a plurality of stages that are connected via a turnaround portion (Figure 5 number 128) and a bypass that connects an upstream side stage of the gas passage to a downstream side stage of the gas passage and that causes a gas that flows in via a gas inlet of the bypass to flow out of a gas outlet (Figure 5 number 124).*" That is, the Examiner alleges that number 128 indicates a *gas passage* which corresponds to a bypass of a *gas flow passage* of the present invention. However, number 128 is a bypass (i.e., flow pass) provided in a *coolant flow passage* (i.e., coolant flow field). Number 124 is a (second) *coolant flow field* (note that a first coolant flow field is shown in another case without E-shaped barrier 134 of FIG. 5). In FIG. 5 a *gas passage* is shown by *112'*, and a *gas inlet and outlet* are shown by *70'* and *72'*, respectively. There is not provided a *"bypass" in the gas passage 112'.*

The Examiner, furthermore, alleges that "*Colllins et al. teaches that the gas inlet and the gas outlet are located at a same side of the separator (Figure 6 number 144 and 142).*" However, number 142 and 144 are an inlet and an outlet of coolant flow, and a gas inlet and a gas outlet are shown by 70" and 72" respectively.

The Examiner, furthermore, alleges that "*Collins et al. disclosed that the gas passage is defined by a sidewall of the separator and a rib or by two ribs (Figure 5 number 136, 138).*" However, these ribs 136, 138 are not provided in the gas passage, but are provided in the coolant passage.

Furthermore, the Examiner alleges that "*Collins et al. teaches that the bypass is located at a side of the separator opposite from the gas inlet and gas outlet (Figure 2 number 50-52).*" As noted previously, number 50 is an anode catalyst and number 52 is a cathode catalyst; that is, neither of them is a bypass. In Collins, the relationship of "the position of bypass" and "gas inlet and gas outlet" which puts the separator between them is not described. By contrast, according to the present invention as claimed the bypass is located at a side of the separator opposite from the gas inlet and gas outlet. See FIG. 3 of the present application, showing bypass 32 located at a side of the separator opposite from the gas inlet 31a and gas outlet 31b.

The gas passage of the claimed separator, as noted previously, is a completely different structure from Collins' coolant passage, and consequently has completely different effects and purposes. Specifically, in order to exert an ability of a fuel cell to the maximum possible, it is desired that an electric current density in a surface of a cell of the fuel cell is equal (i.e. uniform) to the maximum possible. This is because, if there is a density gradient of electric current in the surface, an amount of water generated at a portion of the higher density of electric current is more than an amount of water generated at a portion of the lower density of electric current. This causes a problem of discharge of the generated water. Furthermore, since the electric current is concentrated at a small portion of the surface of the separator, an electric resistance actually increases.

One method for equalizing the electric current density is to equalize the temperature of the cell in the surface of the cell as shown in Collins. However, it is not sufficient, because the problem of unevenness of electric current density is not solved; that is, uneven density of electric current density remains in the surface. If the uniformity of electric current density is decreased as the density of the reacted gas is not equalized in the surface and, if a speed of the gas flow is lower at the downstream side, water generated at the downstream side remains (i.e., stays) in the cell, which

causes stoppage of the gas passage and further unevenness of electric current density occurs as a result.

The cited reference, Collins, simply focuses on the gradient of temperature and discloses only equalization of the temperature in the surface of the cell by using the bypass of coolant flow passage for controlling the temperature. However, in Collins, there is not any description or indication concerning the subject matter that unevenness of electric current density is caused by an uneven distribution of gas density or lower flow speed of gas. Furthermore, although the amount of coolant does not decrease as the coolant flows in the cells, an amount of the reacted gas is consumed responding to the generation of electric current. Collins contains no hint of recognition of the latter phenomenon. By contrast, the present inventors have recognized this phenomenon, and accordingly created the claimed structure. A technology, as claimed, responsive to a bypassing of a flow in a passage of reacted gas which is consumed responsive to the generation of electric current cannot be arrived at from Collins' disclosure, which by contrast relates to bypassing a flow passage for controlling temperature.

In view of the above, claims 1 and 6 are allowable over Collins, as are claims 2-5, 7-9 and 11 for at least the reason that they depend on one of claims 1 or 6. Withdrawal of the rejection of claims 1-9 and 11 as being anticipated by Collins is therefore respectfully requested.

Claims 1, 2, 6, 7 and 10 were rejected under 35 USC 102(b) as being anticipated by Mizuno et al. (US 6,387,558) ("Mizuno"). Claim 10 has been canceled. The Applicant respectfully traverses the rejection of claims 1, 2, 6 and 7. Mizuno does not support the asserted rejection for at least the reason that Mizuno does not disclose a bypass that connects an upstream-side stage of a gas passage of a separator to a downstream-side stage of the gas passage, as recited in independent claim 1, or a bypass that connects a most upstream-side turnaround portion of a gas passage of a separator to a most downstream-side turnaround portion of the gas passage, as recited in independent claim 6.

The Examiner appears to have incorrectly equated the claimed bypass with an oxidative gas supply manifold 60 of Mizuno. However, the oxidative gas supply

manifold 60 of Mizuno is not formed in a separator as claimed, but in a stack structure 15. See FIGs. 3 and 5 of Mizuno, and col, 7, lines 47-54 and col. 9, 59-61

Further, the point of the present invention is that a **gradient of concentration** is decreased (i.e., becomes slow) by providing the bypass inside the cells. By contrast, in Mizuno, a **gradient of flow amount** between cells is decreased (i.e., becomes slow) by providing a bypass inside cells. In the present invention, an electric generation efficiency is increased by supplying high concentration gas upstream of the cells to downstream of the cells. On the other hand, in Mizuno, an electric generation efficiency is increased by equalizing (or making uniform) the flow amount between cells. In short, the manifold 60 of Mizuno connects gas passages between the cells, and a bypass is not formed in the manifold, as by contrast is called for in present claims 1 and 6. Therefore, the present invention as claimed is completely different from Mizuno's arrangement.

Furthermore, Mizuno does not disclose a gas inlet to the separator and a gas outlet from the separator that are located at a same side of the separator and opposite to the bypass, as further recited in claims 1 and 6.

Claims 1 and 6 are therefore allowable over Mizuno, as are claims 2, 7 and 10 for at least the reason that they depend on one of claims 1 or 6. Withdrawal of the rejection of claims 1,2 6, 7 and 10 as being anticipated by Mizuno is therefore respectfully requested.

Conclusion

In light of the above discussion, Applicant respectfully submits that the present application is in all aspects in allowable condition, and earnestly solicits favorable reconsideration and early issuance of a Notice of Allowance.

The Examiner is invited to contact the undersigned at (202) 220-4323 to discuss any matter concerning this application. The Office is authorized to charge any fees related to this communication to Deposit Account No. 11-0600.

Respectfully submitted,

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